

## **NERRS Science Collaborative Progress Report for the Period 9/1/2010 through 2/28/2011**

**Project Title:** A collaborative approach to address larval supplies and settlement as critical early life-history issues during restoration of native Olympia oysters (*Ostrea lurida*) in Coos Bay and the South Slough estuary

**Principal Investigator(s):** Dr. Steven S. Rumrill

**Project start date:** Nov 2010

**Report compiled by:** Steven S. Rumrill

### **Contributing team members and their role in the project:**

**Integration Leader:** Frank Burris, Extension Watershed Educator  
Oregon State University Extension Service  
Gold Beach, OR  
Role in project: Facilitation of interactions between the stakeholders (Olympia Oyster Restoration Advisory Committee) and project team members. Mr. Burris has expertise with community stakeholder discussions in rural environments, and will provide for integration and leadership through the joint fact-finding / structured decision-making process.

**Co-Principal Investigators:** Dr. Craig Young, Professor of Biology  
University of Oregon / Oregon Institute of Marine Biology  
Charleston, OR  
Role in project: Director of OIMB and collaborating project scientist with particular expertise in the reproductive biology and larval ecology of marine and estuarine invertebrates. Dr. Young will serve as the primary graduate thesis advisor for one graduate student (module 1 / reproduction and reproductive output) supported by the project.

Dr. Alan Shanks, Professor of Biology  
University of Oregon / Oregon Institute of Marine Biology  
Charleston, OR  
Role in project: Collaborating project scientist with particular expertise in larval behavior, dispersal, and tidally-driven transport in estuaries. Dr. Shanks will serve as the primary graduate thesis advisor for one graduate student (module 2 / larval supplies and dispersal) supported by the project.

Dr. Richard Emlet, Professor of Biology  
University of Oregon / Oregon Institute of Marine Biology  
Charleston, OR  
Role in project: Collaborating project scientist with particular expertise in larval development, hydromechanics, larval settlement, and metamorphosis. Dr. Emlet will serve as the

primary graduate thesis advisor for one graduate student (module 3 / larval settlement and metamorphosis) supported by the project.

Jamie Doyle, Marine Community Development Leader  
Oregon Sea Grant Extension Program (Coos County)  
Myrtle Point, OR

Role in project: Work with project team to develop a series of presentations, fact sheets, briefing materials to ensure that the stakeholders and scientists share a common level of understanding about the biology and ecology of Olympia oysters. Ms. Doyle has expertise with marine resource policy and management, community education, and outreach, and she will provide assistance to the Integration Leader with the SDM process.

John Bragg, Coastal Training Program Coordinator  
South Slough National Estuarine Research Reserve  
Charleston, OR

Role in project: Work with project team to develop a series of presentations, fact sheets, briefing materials to ensure that the stakeholders and scientists share a common level of understanding about the biology and ecology of Olympia oysters. Mr. Bragg has expertise with condensation of technical research materials into summary sheets, and will provide an interface for the project with the South Slough National Estuarine Research Reserve.

- A. Progress overview: State the overall goal of your project, and briefly summarize in one or two paragraphs, what you planned to accomplish during this period and your progress on tasks for this reporting period. This overview will be made public for all reports, including confidential submissions.

The overall goal of this project is to investigate the importance of reproductive timing and output, larval supplies, estuarine retention time, settlement, and recruitment as factors that potentially limit recovery of self-sustaining populations of *Ostrea lurida* in Coos Bay and the South Slough estuary. Our specific objectives are to: (A) bring together a diverse group of stakeholders and user-groups to form an Olympia Oyster Recovery Advisory Committee (OORAC); (B) determine the suite of intrinsic ecological, reproductive, and early life-history factors that contribute to the success of Olympia oyster restoration efforts in Coos Bay/South Slough; and (C) integrate the perspectives and collective knowledge from resource agencies, academic investigators, mariculture operators, restoration practitioners, and recreational stakeholders during development of an Olympia Oyster Conservation and Recovery Strategy for Coos Bay.

The original work-plan for the start-up period of the project (September 2010 to February 2011) included recruitment of new graduate students from the University of Oregon – Oregon Institute of Marine Biology who will conduct the original scientific research that is focused on module 1 (oyster reproduction and reproductive output), module 2 (larval supplies and dispersal), and module 3 (larval settlement and metamorphosis). Other tasks identified during the initial start-up period include acquisition of a scientific collection permit issued by the Oregon Department of Fish and Wildlife, establishment of the membership of the Olympia Oyster

Recovery Advisory Committee (OORAC), development of a template for the joint fact-finding / structured- decision-making process, holding the first meeting of the OORAC, and establishment of the graduate student thesis advisory committees.

The University of Oregon / Oregon Institute of Marine Biology is still in the process of selecting the graduate students who will work with the Principal Investigators and the stakeholders to conduct the scientific research to address module 1 (oyster reproduction and reproductive output), module 2 (larval supplies and dispersal), and module 3 (larval settlement and metamorphosis). The original proposal submitted to the NERRS Science Collaborative provides a description of three master's-level graduate students who will investigate the reproductive biology and larval ecology of the Olympia oysters as the primary foci of their MSc thesis research. However, faculty members from the Oregon Institute of Marine Biology are currently in negotiations with two PhD-level graduate students who may conduct the work with Olympia oysters as a part of their broader graduate thesis research.

The principal investigator (Steve Rumrill) met with Kelle Matso (Program Manager; NERRS Science Collaborative) in Rhinebeck, NY on 2 March 2011 to discuss the delays in project implementation and to formulate an adjusted plan for project initiation. In accordance with the mission of the NERRS Science Collaborative, it is intended that the scientists, graduate students, team leader, outreach team, and members of the stakeholder committee work together to develop a common knowledge base about the factors that control Olympia oyster populations, and to identify the specific steps that will be taken to address the problem of population recovery in Coos Bay. Consequently, Rumrill and Matso agreed that the initial meeting with the stakeholder committee would be postponed until summer 2011 when the new graduate student for module 1 (reproduction and reproductive output; Mark Oates) will have arrived at the Oregon Institute of Marine Biology where he will be available on-site to participate directly in the initial meeting with the members of the Olympia Oyster Restoration Advisory Committee.

#### B. Working with Intended Users:

- Describe the progress on tasks related to the integration of intended users into the project for this reporting period.
- What did you learn? Have there been any unanticipated challenges or opportunities?
- Who has been involved?
- Has interaction with intended users brought about any changes to your methods for integration of intended users, the intended users involved, or your project objectives?
- How do you anticipate working with intended users in the next six months?

The primary intended users of data and information generated by this project are: (A) the Oregon Department of Fish and Wildlife / Shellfish Management Program; (B) the NOAA Restoration Center / Community-Based Restoration Program; and (C) members of the local stakeholders advisory group (e.g., OORAC). The project PI, scientists from the University of Oregon, and representatives from the ODFW, NOAA CBRP, and TNC participated in a state-by State goal-setting exercise during the West Coast Native Oyster Restoration Workshop (September 2010; Poulsbo, WA). A series of draft state-wide planning goals were developed to help guide Olympia oyster restoration and recovery efforts throughout Oregon (see Appendix A). The draft state-wide goals were presented to ODFW and NOAA Fisheries in February 2011, and they are intended to provide a starting point for future discussion regarding establishment of the conservation and recovery strategy for Oregon. The draft goals will also be presented to OORAC, and the stakeholder group will consider these broad statewide goals and objectives during development of the local conservation strategy for Coos Bay.

Several members of the OORAC participated in November and December 2010 during development of a television documentary titled "*The Oystermen*." The 20-minute documentary focused on the history of commercial oyster mariculture activities in Oregon, and it was produced by Oregon Public Broadcasting as part of the ongoing series "The Oregon Experience." OPB Producer Eric Cain (Portland, OR) conducted videotaped interviews with several of the project scientists and stakeholders including Steve Rumrill (University of Oregon / South Slough NERR), Scott Groth (Oregon Department of Fish and Wildlife), Lili Clausen (Silver Point Oyster Co.), Larry Qualman (Qualman Oyster Co.) and Don Ivy (Coquille Tribe). The documentary was presented to the public on 14 April 2011 at the Coos Bay Library, and it aired on the Oregon Public Broadcasting television station on 18 April 2011. Public showing of "*The Oystermen*" documentary was followed by a "town-hall" meeting and period of extended open discussion. Issues were raised by the viewing audience about ecological functions and services provided by oysters and other shellfish in Coos Bay, about the status of recovering Olympia oyster populations, and about the potential for competitive interactions between the native and non-native oysters. The viewing audience also asked questions about the potential role of commercial mariculture operations in the recovery of Olympia oyster populations in Coos Bay.

Due to the delay in hiring of the ODFW Shellfish Program Leader (a key Intended User) and slow recruitment of the graduate students who will conduct original research associated by the project, we have not yet formally convened the members of the OORAC in a local stakeholders meeting. Despite these challenges, our informal interactions with the intended users and stakeholders have been frequent and productive. For example, the project PI participated actively over the winter and spring in the recruitment and selection of the ODFW Shellfish Program Manager position, and members of the science team (S. Rumrill, C. Young, A. Shanks, R. Emlet) worked together to complete the evaluation and screening process to select and recruit the new graduate students who will be supported by the project. In addition, members of the science team (South Slough NERR) frequently provide the local commercial oyster growers with print-outs and descriptions of changes in ambient estuary water quality conditions derived from time-series data generated by the NERR System-wide Monitoring Program.

By working across the multiple sectors of academia, state and federal resource agencies, commercial shellfish industry operators, restoration practitioners, and other stakeholders, we have gained recognition that it will be challenging, difficult, and rewarding to bring all of the members of OORAC into same place at the same time. Although the membership of OORAC is focused on individuals who work and reside in the immediate vicinity of Coos Bay, several members will contribute expertise from their positions well outside the bay area (e.g., other cities, Washington, California). We anticipate that we will convene the members of the OORAC into the initial stakeholder group meeting in August 2011.

C. Progress on project objectives for this reporting period:

- Describe progress on tasks related to project objectives for this reporting period.
- What data did you collect?
- Has your progress in this period brought about any changes to your methods, the integration of intended users, the intended users involved or the project objectives?
- Have there been any unanticipated challenges, opportunities, or lessons learned?
- What are your plans for meeting project objectives for the next six months?

Members of the science team completed the recruitment of a new graduate student (Mr. Mark Oates) who will join the Oregon Institute of Marine Biology from his home in Florida. Mark will work under the direct supervision of co-PI C. Young and in collaboration with the intended users

and OORAC stakeholders to complete his graduate thesis investigation that focuses on module 1 (reproduction and reproductive output). In addition, the OIMB faculty members have come to agreement on the selection of a second prospective graduate student who will focus on module 2 (larval supplies and dispersal). Early work has begun to develop a localized conceptual model of the factors that control larval settlement and recruitment in populations of Olympia oysters, and to develop a series of one-page fact sheets to describe characteristics of the natural history and reproductive biology of the Olympia oysters. In addition, the membership of OORAC has been established with the understanding that new members may be added to meet emerging needs (see Appendix B).

Several different types of data were collected by members of the science team over the winter and early summer months. These datasets include: (A) time-series measurements of estuarine water quality parameters generated by the South Slough NERR System-wide Monitoring program (estuarine water temp, sal, cond, pH, DO, Chl-a, turb) at several locations along the estuarine gradient of the South Slough (S. Rumrill); (B) time-series measurements of estuarine water temperatures generated by Hobo TidBit dataloggers deployed at several locations in the mesohaline region of Coos Bay (A. Shanks / L. Garcia; OIMB); (C) monthly CTD casts within the primary tidal channel of Coos Bay (A. Shanks / L. Garcia; OIMB); (D) biweekly assessment of new Olympia oyster recruits to shells of pacific oysters deployed in Coos Bay (C. Young / K. Sawyer; OIMB); and (E) deployment of 75 bags of Pacific oyster shell to serve as settlement sites for recruitment of juvenile Olympia oysters in Coos Bay. In addition, project PI Steve Rumrill worked with a joint federal-state task team over the period of February 7-18, 2011 to conduct an investigation of tidal hydrodynamics in Coos Bay during a period of intense storm activity. The hydrodynamic study included tracking the dispersal and advective movement of surface drogues, recording the concentration and dilution of fluorescent rhodamine dye tracers, deployment and recovery of living oysters for an evaluation of pathogen exposure, and CTD casts to develop physical profiles of the estuarine water masses. These data sets will be incorporated into a hydrodynamic model of the greater Coos Bay estuary, and the model will be used later in the project to estimate the retention time of Olympia oyster larvae after they are released into the plankton.

Changes in methods: It is recognized that the project PI has been deficient in maintaining active and regular communication among the project team members and the NERRS Science Collaborative during the period of recruitment of the new OIMB graduate students. Although members of the science team worked together to complete the process of solicitation, evaluation, ranking, and selection of the graduate students, other members of the project team and the NSC were not provided with regular updates and information that contributed to a delay in project implementation. In order to remedy this situation, the PI has requested that project co-PI John Bragg (South Slough NERR) assume additional duties to serve as the leader for internal communications among the team members and the NSC. It is also recognized that it may be advantageous to expand the membership OORAC to include local elected officials (*i.e.*, Mayor of Coos Bay, Coos County Commissioner), particularly during the early stages of development of the Olympia Oyster Conservation and Recovery Strategy document.

Unanticipated challenges (Potential Impact of a Liquefied Natural Gas Terminal on Populations of Olympia Oysters): The communities of Coos Bay, North Bend, and Charleston have been actively engaged in public debate over the past several years regarding the scoping and feasibility studies for construction of a new liquefied natural gas (LNG) terminal located along the shoreline of Coos bay at Jordan Cove. The LNG issue

has sparked considerable public debate, and the question of whether to allow construction of the LNG facilities has emerged as one of the paramount problems faced by Coos County and the state of Oregon. Unanswered questions about the potential impacts of dredging (associated with placement of the LNG pipeline) on populations of native Olympia oysters have entered the public debate. Emergence of the LNG/Oyster issue as a pressing topic of local concern may require that the issue be addressed by the OORAC in the course of their discussions about recovery of Olympia oyster populations in Coos Bay.

During the next six months, the project team will hold a project planning meeting shortly after the arrival of the new graduate students to establish the workplan for the summer (July 2011), finalize the membership of OORAC (and make any required additions to accommodate the LNG/Oyster issue), hold the initial meeting of OORAC (August 2011; purpose, member introductions and initial perceptions, problem definition, SDM process), conduct field surveys and laboratory work to characterize the populations and reproductive output of Olympia oysters, and prepare a series of fact sheets and presentations on the natural history and reproductive biology of Olympia oysters for presentation during the second OORAC meeting (October 2011). The science team will also work in a collaborative manner with the intended users and members of OORAC to further develop the focus, questions, and workplan for the OIMB graduate student (Mark Oates) who will address module 1 (reproduction and reproductive output) and for the OIMB graduate student who will address module 2 (larval supplies and dispersal).

D. Benefit to NERRS and NOAA: List any project-related products, accomplishments, or discoveries that may be of interest to scientists or managers working on similar issues, your peers in the NERRS, or to NOAA. These may include, but are not limited to, workshops, trainings, or webinars; expert speakers; new publications; and new partnerships or key findings related to collaboration or applied science.

- Draft State of Oregon 10-year Goals for Olympia Oyster Restoration and Recovery (Appendix A. Excerpt from: NOAA Restoration Center and Puget Sound Restoration Fund. 2010. West Coast Native Oyster Restoration: 2010 Workshop Proceedings. US Department of Commerce, NOAA restoration Center. 49 pp.)

E. Describe any activities, products, accomplishments, or obstacles not addressed in other sections of this report that you feel are important for the Science Collaborative to know.

- “*The Oystermen*” documentary produced by Oregon Public Broadcasting. The documentary provides a description of the historical development of the commercial oyster industry in Oregon, efforts to recover native Olympia oysters, and interviews about oyster issues with OORAC members. “*The Oystermen*” documentary is available on the OPB website: <http://www.opb.org/programs/oregonexperience/programs/34-The-Oystermen>.
- The high level of public and resource agency interest in the potential impact of a Liquefied Natural Gas terminal on populations of Olympia oysters was unanticipated. The project PI (S. Rumrill), the Integration Leader (F. Burris), and project co-PI (J. Bragg) discussed the likelihood that the LNG/Oyster issue may sidetrack the OORAC discussions and redirect their focus away from development of a conservation and recovery strategy. This concern may develop in the event that the public/agency debate becomes structured around the polarizing

themes of “pro-development/anti-oyster” or “pro-oyster/anti-LNG.” The team members agree that it will be unwise for OORAC to avoid the prominent LNG/Oyster issue, and deliberate steps will be taken to address the potential LNG impacts as a component of the SDM process.

Appendix A. Draft State of Oregon 10-year Goals for Olympia Oyster Restoration and Recovery  
Excerpt from: NOAA Restoration Center and Puget Sound Restoration Fund. 2010. West Coast  
Native Oyster Restoration: 2010 Workshop Proceedings. US Department of Commerce, NOAA  
restoration Center. 49 pp.

## **State of Oregon: Draft 10-Year Goals for Restoration and Recovery of Olympia Oyster Populations**

### **GOALS:**

#### **1. Population Assessment and Characterization**

An accurate, comprehensive, and quantitative survey of Olympia oyster populations has not yet been carried out for Oregon estuaries. The baseline survey should include information to describe the historic and current distribution of native oysters. This information can additionally be included in oil spill contingency plans in case of a spill.

The effort to survey current native oysters should include:

- Quantitative assessments, rather than just presence/absence;
- Standardized protocols to make sites comparable and increase sampling rigor;
- Baseline reference sites for intensive, repeated assessments;
- Environmental and community ecology parameters;
- Information about interactions with eelgrass and commercially important species;
- Extent, reproductive output and importance of subtidal populations;
- Role of sedimentation and salinity in determining population depths.

Other activities should include:

- Complete a retrospective assessment of the historic distribution of Olympia oysters in Oregon estuaries.
- Assess potential oyster bed habitat in order to establish potential restoration goals – this provides an alternative method to goals based on percentage of historic population size.
- Project how population expansion will incorporate urban components of the estuarine shorelines.
- Incorporate the subtidal zone as potential oyster habitat.
- Use potential habitats to set goals of what's possible and what will provide measurable benefits to estuary.

#### *Implementation:*

The ODFW Marine Resources Program should be encouraged to:

- Recognize the status of Olympia oysters and perhaps create a species status report;
- Include Olympia oysters in the ongoing bivalve surveys conducted by the ODFW shellfish assessment/research team.



## **2. Statewide Regulatory Framework for Conservation and Mitigation**

Establish statewide policy for no-net loss of Olympia oysters in Oregon:

- Limit activity that will be detrimental to existing intertidal and subtidal oyster beds;
- Require mitigation for unavoidable damage/destruction of Olympia oyster beds; and
- Establish a mitigation “bank” to consolidate repeated loss or destruction of small patches or clusters, and to create larger spatial blocks or plots of native oyster habitat

## **3. Develop a Bay-by-Bay Approach to Olympia Oyster Restoration**

Oregon should develop and adopt a bay-by-bay approach to the conservation and restoration of Olympia oysters because the different estuaries exhibit a diversity of geomorphologies, habitat impacts, and ecological potentials for oyster recovery. It is unlikely that a “one size fits all” approach will be successful for estuaries as different as Netarts Bay, Yaquina Bay, and Coos Bay. As surveys of Oregon estuaries are completed, the site-specific restoration goals and priorities for each bay can be developed.

- Netarts: undeveloped, poor recruitment, but lots of potential area for native oyster beds;
- Yaquina: highly developed, consistent recruitment, and single commercial grower of *Crassostrea gigas*; and
- Coos: highly developed, consistent recruitment, and extensive tideflat acres used for commercial mariculture of *Crassostrea gigas* managed by four oyster farmers.

## **4. Integrated Restoration and Enhancement of Genetic Diversity**

- Develop an integrative restoration strategy that is tightly linked with the genetic broodstock program; and
- Expand common-garden experiments and/or genetic markers to investigate the potential ecological and genetic effects of local adaptation.

## **5. Ecosystem Emphasis on Olympia Oyster Restoration**

- Develop a mechanism to link oyster restoration and population recovery to the management framework and ecosystem services that provide direct and indirect benefits to humans; and
- Encourage and integrate Olympia oyster recovery in concert with other wetlands and estuary restoration/conservation efforts.

## **6. Work Closely with Local *Crassostrea* Growers to Recover Olympia Oyster Populations**

- Native Olympia oysters frequently settle on *Crassostrea* shells and are regularly harvested by *Crassostrea* growers. This situation provides a business opportunity that may increase interest in Olympia oyster restoration.

- Oregon / ODFW should not encourage recreational harvest of Olympia oysters (within the next 10 years) but should initially encourage development of harvest guidelines that can be followed by the existing commercial oyster farms.
- Oregon should strive to integrate Olympia oyster conservation and recovery with aquaculture to the greatest extent possible, and to place recovery of native oysters on the map in a broader framework (such as the State of MD oyster recovery plan).

## **7. Conduct Research to Investigate Early Life History Events in Population Recovery**

- Work with academic scientists to investigate the production of oyster larvae, the abundance and distribution of larval supplies within the estuaries, and the potential and realized larval dispersal;
- Conduct hydrodynamic modeling and particle tracking work to investigate the potential for larval retention and export from the Oregon bays and estuaries;
- Conduct laboratory and field experiments to document larval settlement preferences, delay of settlement, and patterns of juvenile recruitment within the different estuaries; and
- Document the survival of early juvenile stages that are subject to thermal stress, sedimentation, desiccation, differences in food availability, predation, and competition.

## **8. Investigate the Potential Impacts of Climate Change on Olympia Oyster Populations**

- Estimate the vulnerability of oyster populations to different types of climate-change stressors. Ensure that the strategy taken by state of Oregon incorporates potential climate change effects, such as:
  - sea level rise
  - increased frequency and intensity of coastal storms
  - changes in seawater temperature, salinity, dissolved oxygen
  - ocean acidification, pCO<sub>2</sub> and pH changes, calcification saturation states
  - freshwater inputs

## **9. Public Education and Outreach**

- More outreach, communication to the community;
- Workshops, multi-media approach, local events;
- Outreach efforts should be coordinated between groups;
- Training at different levels: volunteers, undergraduates, graduate students; and
- Collaboration between people working within Oregon on native oyster restoration.

## Appendix B. Olympia Oyster Recovery Advisory Committee

Purpose: The primary role of the Olympia Oyster Recovery Advisory Committee will be to provide diverse input in the form of technical expertise, practical knowledge, management alternatives, and stakeholder perspectives throughout the Structured Decision-Making process that will be used to develop the Olympia Oyster Conservation and Recovery Strategy document. The OORAC will meet with the project team on a quarterly basis to receive project updates, provide feedback, and to make critical decisions regarding development of the strategy that will be followed to restore populations of Olympia oysters within Coos Bay and the South Slough estuary.

### Membership:

#### A. Natural Resource Agencies

- Oregon Department of Fish and Wildlife / Shellfish Program (Scott Groth)
- Oregon Department of Agriculture / Oyster Lease Program (Jim Johnson)
- Oregon Department of State Lands (Bob Lobdell)
- Oregon Department of Land Conservation and Development (Andy Lanier)
- Oregon department of Environmental Quality (Pamela Blake)
- US Army Corps of Engineers (Kate Groth)
- NOAA National Marine Fisheries Service (Bridgette Lohrman)

#### B. Academic Investigators

- Oregon Institute of Marine Biology (Craig Young, Richard Emlet, Alan Shanks, Laura Garcia)
- Oregon State University (Chris Langdon)
- University of Washington (Alan Trimble)
- University of California – Davis (Ted Grosholz)

#### C. Commercial Shellfish Mariculture Operators

- Coos Bay Oyster Company (Heath Hampel)
- Silver Point Oysters (Lili Clausen)
- Qualman Oyster Company (Larry Qualman)
- North Bend Oyster Company (Jerry Hampel)
- Yaquina Bay Oysters (Xin Liu)
- Whiskey Creek Shellfish Hatchery (Sue Cudd)

#### D. Port and Harbor Districts

- Oregon International Port of Coos Bay (Martin Callery)
- Port of Yaquina Bay (Don Mann)

#### E. Native Oyster Restoration Practitioners

- NOAA Community-based Restoration Program (Megan Callahan-Grant)
- The Nature Conservancy / Marine Program (Dick Van der Schaaf)
- Puget Sound Restoration Fund (Betsy Peabody)

#### F. Local tribes of Indigenous Peoples

- Coquille Tribe (Don Ivy, Tom Younker)
- Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians (John Schaffer)

G. Public Stakeholders

- Marshfield High School / science teacher (Kevin Cellura)
- Resident of South Slough (Brent Lerwill)
- Resident of Coos Bay / living shorelines (Rex Miller)
- Resident of Coos Bay / birdwatchers (Eric Clough)